

## The significance of lower extremity FDG PET/CT imaging in patients with unknown primary tumor

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### Abstract

If a suspicious finding for primary site of an unknown primary tumor (UPT) is found in limited whole-body FDG PET/CT imaging area, imaging of lower extremities is generally not performed in routine practice. This approach may not be true. In this case, FDG PET/CT imaging was performed in patient with UPT. The limited whole-body FDG PET/CT images showed an increased FDG uptake in a thyroid nodule which was seemed to be a primary lesion at first sight. But similar FDG PET/CT findings might be observed in benign thyroid nodules. So we also acquired FDG PET/CT images of the lower extremities. Then, a mass showing increased FDG uptake was seen in the left thigh. On histopathologic examination, the thyroid nodule was found to be benign and the left thigh mass was diagnosed with a malignant (hemangiopericytoma). This case demonstrates contribution of lower extremity FDG PET/CT imaging to detection of primary site of UPTs in suspected situations

**Key words:** Positron emission tomography, unknown primary tumor, field of view, lower extremity, hemangiopericytoma

### Introduction

Unknown primary tumor (UPT) is described as a proven malignancy with unidentified primary origin (1). UPTs account for approximately 5% of all malignancies and it is the fourth most common cause of death from cancer (2,3). Diagnosis of the primary origin is essential for the treatment of the patient. Nowadays, 2-(18F) fluoro-2-deoxy-D-glucose (FDG) positron emission tomography/computed tomography (PET/CT) whole-body imaging is widely used for this purpose (1). Even though FDG PET/CT is entitled as whole-body imaging, the scanning is routinely performed between the base of skull and upper-mid thigh (4). Nevertheless, it is the right approach to image true whole-body in case of tumors having high risk for the involvement of scalp, skull, brain, or lower extremities (5). In this report, we aimed to emphasize that the significance of adding lower extremity to the FDG PET/CT imaging area in patients with UPT

### Case

The patient was a 60-year-old female with complaints of cough, exhaustion, and weight loss for two months.

Thorax CT scan revealed multiple regular-bordered and round-shaped bilateral pulmonary nodules, of which the largest one had a diameter of 15 mm. The nodules had been thought to be metastatic, and FDG PET/CT scanning was performed for the metabolic characterization of the nodules and also for the diagnosis of a potential primary tumor. The limited whole-body FDG PET/CT images showed multiple bilateral pulmonary nodules, in which the largest one had a dimensions of 17x15 mm and a maximum of standardized uptake value (SUVmax) of 4 (Figure 1). Also, an increased FDG uptake was seen in a regular-bordered and round-shaped left lobe thyroid nodule with the dimensions of 10x10 mm and a SUVmax of 6.1 (Figure 2 and 3).

Although the thyroid nodule seemed to be a primary lesion at first sight, it was possible to observe similar FDG uptake patterns on PET/CT in benign thyroid nodules. Therefore, the FDG PET/CT images of the lower extremities were also acquired. A lobulated mass with millimetric calcifications between the posterior thigh muscles in the left lower extremity with the dimensions of 75x54x114 mm and increased heterogeneous FDG uptake with a SUVmax of 10 were seen (Figure 3 and 4).

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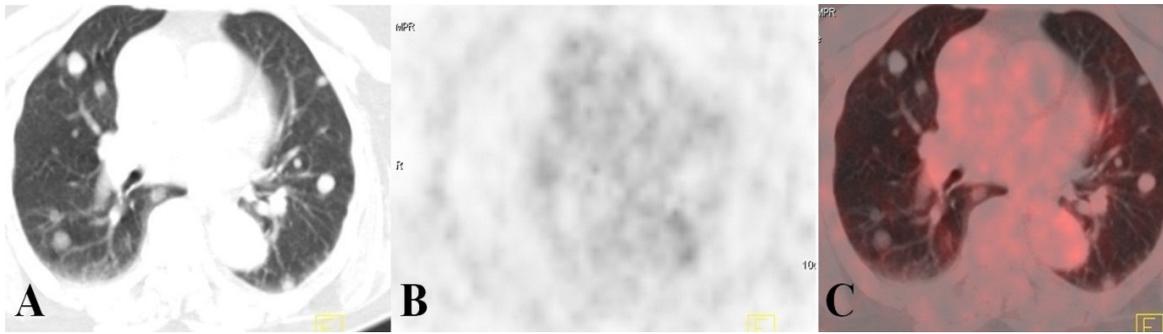
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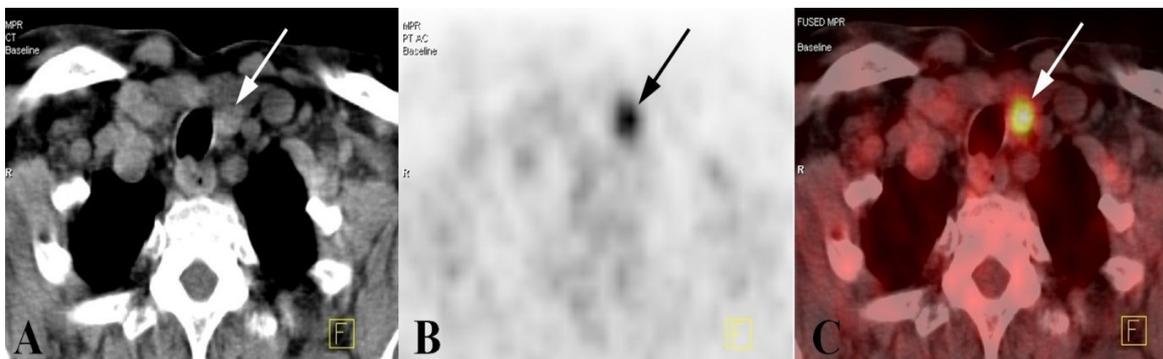
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Fine needle aspiration biopsy was taken from the thyroid nodule. On thyroid fine needle aspiration cytology examination, although the aspiration material was hypocellular, the thyrocytes seen were benign. (Figure 5).

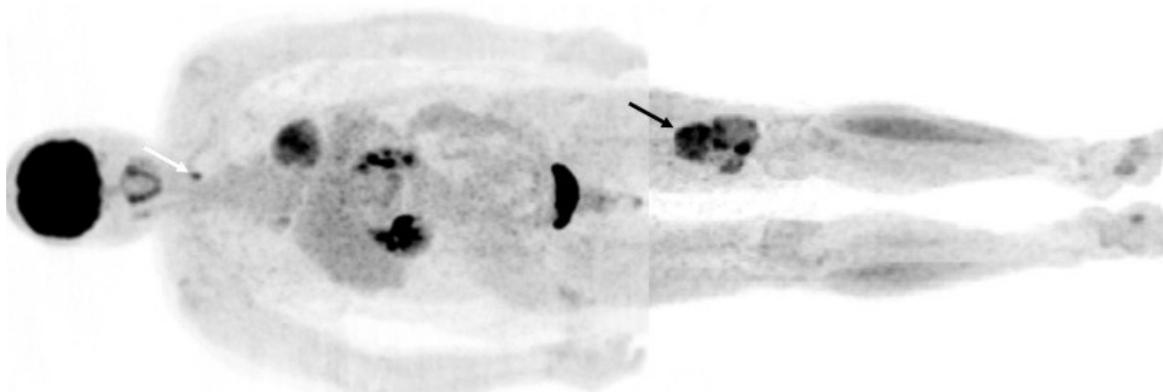
The thigh mass was gone to fine needle aspiration cytology first and it was excised totally. Then it was diagnosed histopathologically as intermediate grade malignant soft tissue sarcoma in the structure of hemangiopericytoma (Figure 6).



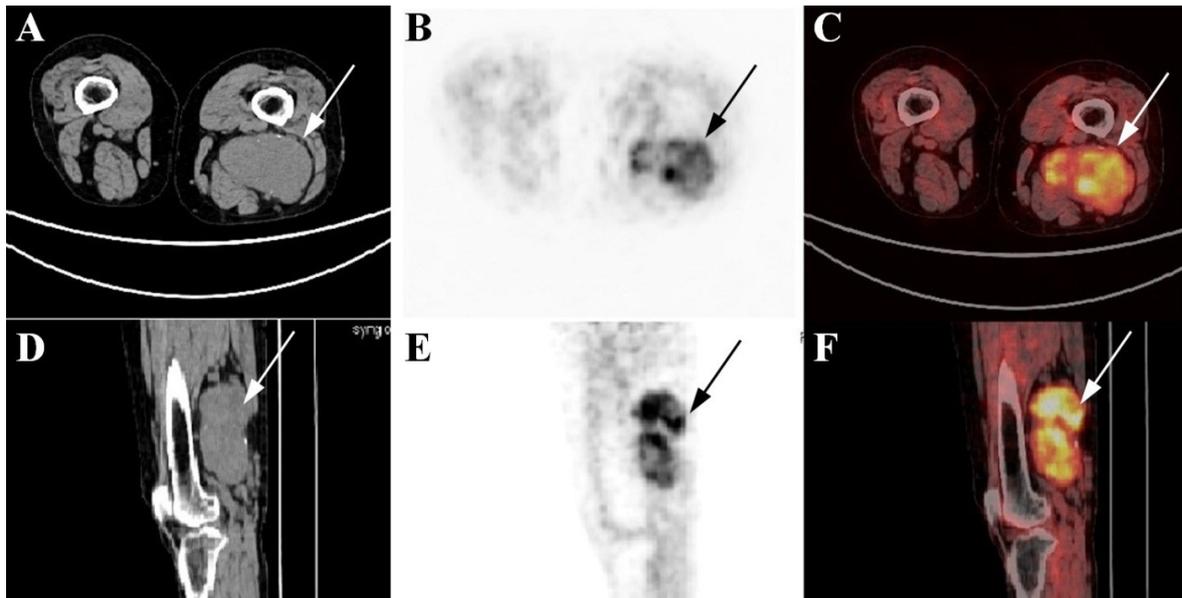
**Figure 1.** Multiple bilateral pulmonary nodules on axial CT (A), PET (B) and PET/CT (C) images.



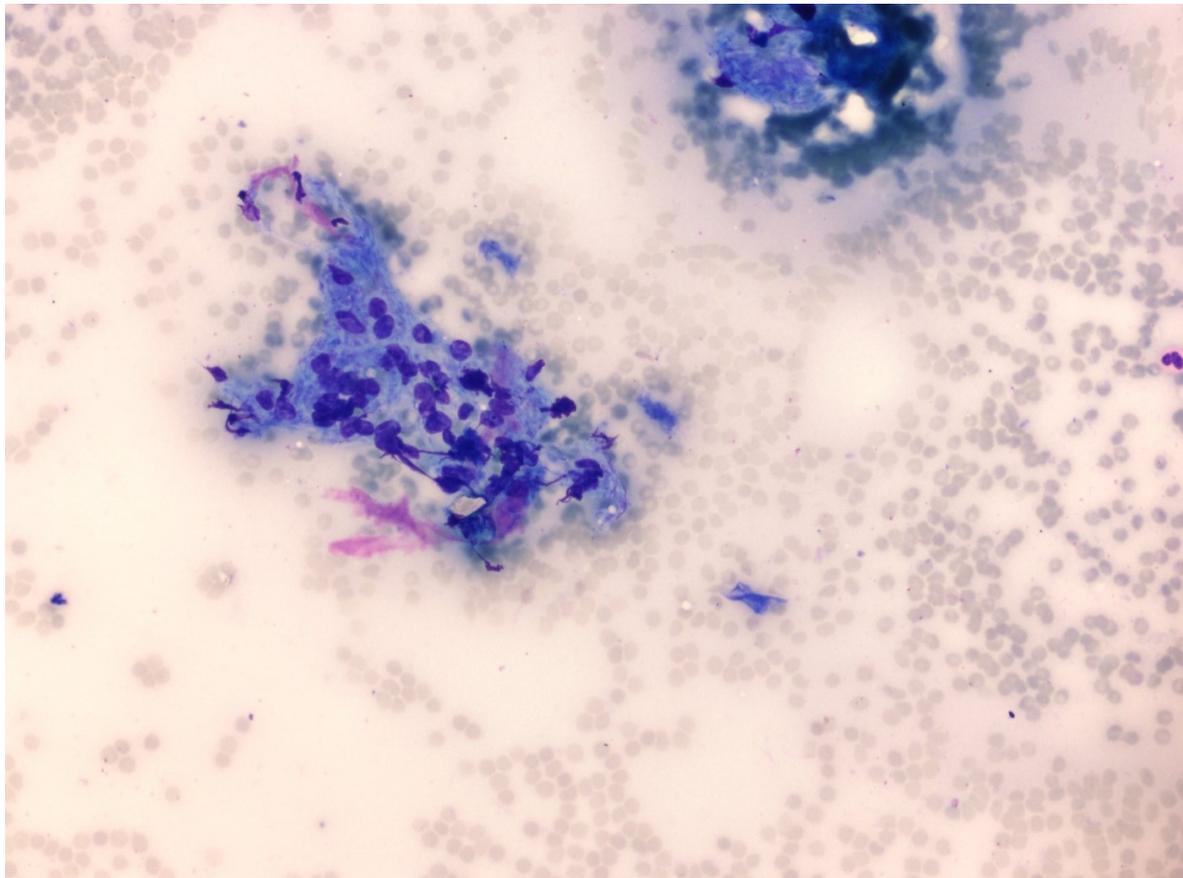
**Figure 2.** Thyroid nodule in the left lobe on axial CT (A), PET (B) and PET/CT (C) images (arrows).



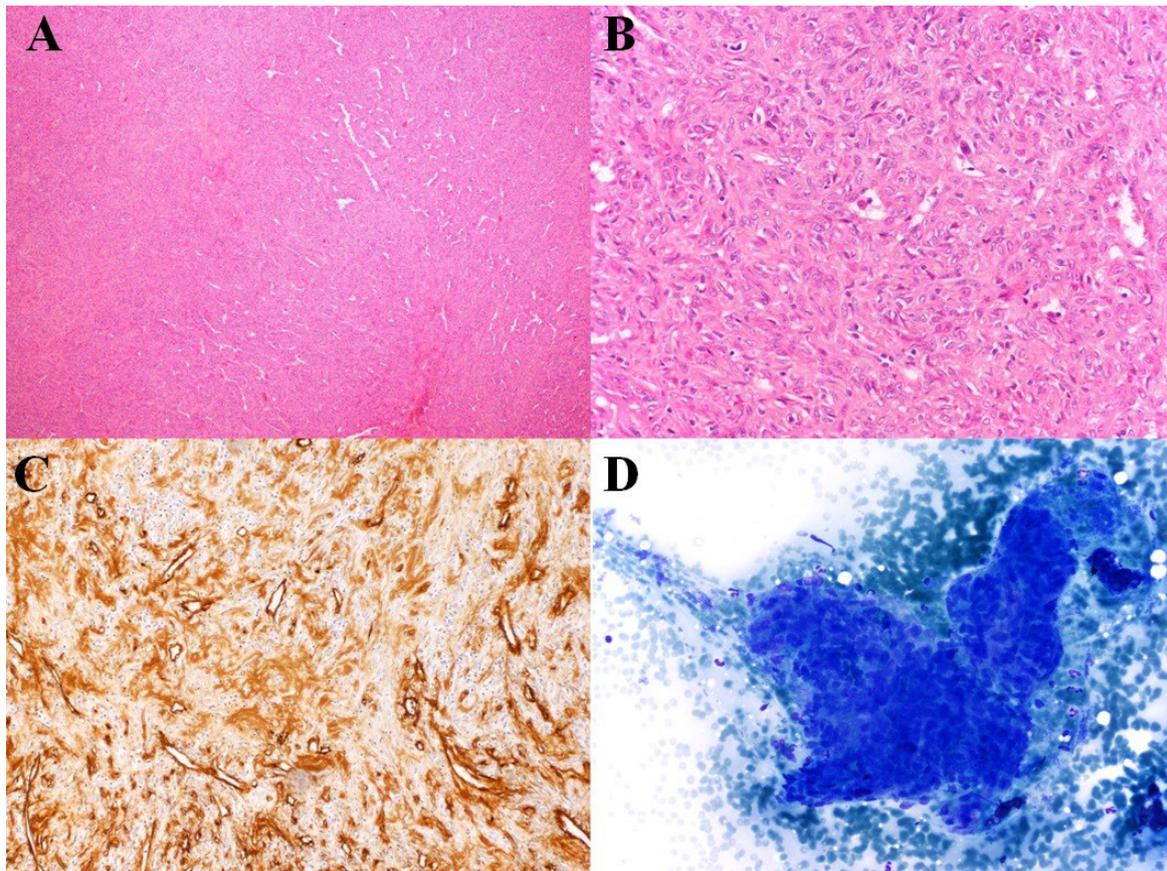
**Figure 3.** Maximum intensity projection (MIP) image of the patient. White arrow shows thyroid nodule in the left lobe and black arrow shows lobulated mass between the posterior thigh muscles in the left lower extremity.



**Figure 4.** Lobulated mass between the posterior thigh muscles in the left lower extremity on axial CT (A), PET (B), PET/CT (C) and sagittal CT (D), PET (E) and PET/CT (F) images



**Figure 5.** Benign-looking thyrocytes.



**Figure 6.** Spindle cell tumor having arborizing vascular structures (H&E,×40) (A). Spindle cells with moderately cellular tumor (H&E,×200) (B). Tumor cells stained with Factor VIII antibody (Factor VIII, x100) (C). Cohesive spindle-shaped cell cluster on cytology (MGG, x200) (D).

## Discussion and Conclusion

In literature, there are several reports about the inclusion of other body parts to the limited whole-body area on FDG PET/CT imaging (4,6-13). However, only two of them have evaluated the clinical contributions of the lower extremity imaging (4,9). In the study performed by Osman et al., the lower extremity imaging did not result in any change in terms of the stage of the disease in 14 patients with UPT (4). Sebro et al. studied 46 patients with UPT and reported that the lower extremity scanning changed the tumor stage in only one patient (9).

In our literature review, we did not identify any study that has revealed any primary origin by means of the lower extremity FDG PET/CT scanning in patients with UPT. Besides, there is no clear statement in the main FDG PET/CT guidelines about including the lower extremities in FDG PET/CT imaging in patients with UPT (5,14,15). For this reason, there are various implementations in the nuclear medicine clinics and there is no standard imaging procedure for this indication.

Some clinics perform limited whole-body scanning, paying no attention to the detection of a primary lesion. And, some clinics include other body parts if a primary tumor is not detected in limited whole-body field of view. If a suspicious primary lesion is found in the limited whole-body scan, then imaging of other body parts are generally not performed. This case represents that this kind of approach may not be true.

In conclusion, this case demonstrates the contribution of adding lower extremity to the limited whole-body imaging area on FDG PET/CT imaging for the detection of the primary site of UPT in case primary tumor is not found or the determined primary focus has any doubt in the limited whole-body imaging area

**Conflict of Interest:** The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. We thank Ahmet Yilmaz from Dicle University Medical Faculty for his invaluable help the manuscript's publishing process.

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